Computer Science

JOYSTICK CONTROL FOR TINYOS ROBOT

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Abstract

The goal of this project was to write a program that controls a TinyOS robot with an off-the-shelf joystick. TinyOS is a small event-driven operating system that was created by David Culler's group in the EECS department at UC Berkeley. It is small enough for a little robot to use. The TinyOS communication model has a command for initiating a message transmission, and signals an event on the completion of transmission or the arrival of a message. Messages in Tiny OS follow the Active Message (AM) model so that each message or packet contains a destination address, a handler number, a data payload, and a CRC checksum. To accomplish this goal, we created a MATLAB program that reads position information from a joystick, builds a TinyOS packet, and sends that information to the serial port. We connected a mica mote, running a standard TinyOS generic base station program to the serial port, which relays the TinyOS packet to a mobile robot via the Radio Frequency (RF) Monolithics 916.50 MHz transceiver (TR1000) communication stack of the mica mote. The mobile robot, running a TinyOS application program, then processes this packet and drives according to the joystick. Thus, we were able to drive our TinyOS robot remotely. The robot is a modified Kyosho Mini-Z RC toy car with attached mica mote.

There are many robot applications for which joystick control is useful. For instance, the NEST (Networked Embedded Systems Technology) team at UC Berkeley is currently working on developing aerial vehicles and ground vehicles to act as pursuer robots, which try to capture evader robots within a given bounded area. The pursuers are designed to operate autonomously while a human controls the evader from a distance. This pursuit-evasion project will use a MATLAB interface to send a packet from a joystick or a keyboard to drive the evader. Joystick control is also useful for a fire fighter to remotely control robot vehicles to fight a fire, and for a health care giver to drive a robot around the user's room.

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